REMARKS/ARGUMENTS

Reconsideration and allowance in view of the foregoing Amendment and the following Remarks are respectfully requested.

In the final Official Action, claims 1, 2, 4-6 and 14 were rejected under 35 USC 103(a) as being unpatentable over Tatumoto et al in view of either Kobayashi et al or Nanataki et al with or without evidence from the instant invention or Fujishiro et al. Claim 5 was rejected under 35 USC 103(a) as being unpatentable over Tatumoto in view of Kobayashi and Nanataki and further in view of JP 9-26409. Claim 6 was rejected under 35 USC 103(a) as being unpatentable over Tatumoto in view of Kobayashi and Nanataki and further in view of JP 08-114571. Applicant respectfully traverses these rejections.

In consideration of the above rejection, claim 1 has been amended above to now include the feature that "the insulating sheet has a reference gas chamber defined therein into which a reference gas is introduced, the reference gas chamber being bounded by the solid electrolytic sheet and the insulating sheet" ... and wherein "the reference gas chamber is airtightly bounded by said bonded electrolytic sheet and insulating sheet". This amendment is supported by various passages in Applicants' specification, including page 11, lines 9-13 and lines 29-31, as well as the illustrations in Figures 1 and 2.

The present invention provides a multilayered gas sensing element comprising a solid electrolytic sheet and at least one insulating sheet, and the at least one insulating sheet defines a reference gas chamber. A reference gas is introduced into the reference gas chamber. The sensing element measures the concentration of a specific component contained in an exhaust gas of the exhaust system while using the reference gas of the reference gas chamber. Therefore, it is necessary to airtightly enclose the reference gas between the solid electrolytic sheet and the insulating

sheet(s). That is, it is necessary to airtightly bound the reference gas chamber with the solid electrolytic sheet and the insulating sheet(s).

Because a crystal phase containing silicon dioxide intervenes between the solid electrolytic sheet and the insulating sheet at a part of a bonding boundary between the solid electrolytic sheet and the insulating sheet, the bonding strength can be enhanced at that part of the bonding boundary. Due to this enhancement of the bonding strength, the solid electrolytic sheet and the insulating sheet can be tightly and reliably bonded with each other. Accordingly, the reference gas chamber can be airtightly bounded by the bonded solid electrolytic sheet and the insulating sheet.

In contrast, the combination of Tatumoto and Kobayashi or Nanataki fails to teach or even suggest the enhancement of the bonding strength between an electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina through a crystal phase containing silicon dioxide at a part of a bonding boundary between the electrolytic sheet and the insulating sheet.

More specifically, Tatumoto teaches the bonding between the solid electrolyte 2 having stabilized zirconia of Y_2O_3-ZrO_2 and the insulating layer 4 having alumina and binder. An alumina porous layer 1 and the solid electrolyte 2 laminated on the insulating layer 4 are baked. To obtain the layer 1 becoming porous by means of baking, the particle size, the specific surface area, the baking shrinkage rate and the pore ratio of alumina powder are preset (see Table 1). Further, the grain size and the specific surface area of alumina composing the insulating layer 4 are preset. However, Tatumoto does not teach or even suggest the contribution of SiO_2 to the bonding. The binder of the insulating layer 4 does not contain SiO_2 but is a compound of wax, and ethylene-vinyl acetate polymer and acryl.

Kobayashi teaches a solid electrolyte substance. To adjust the thermal expansion coefficient of the solid electrolyte substance at a value close to that of non-electrolytic ceramics, the solid electrolyte substance comprises yttrium oxide (Y_2O_3),

silicon dioxide (SiO_2) and zirconium oxide (ZrO_2). Therefore, the solid electrolyte substance can be formed on a non-electrolytic ceramic pipe to manufacture an oxygen sensor which induces little thermal shock and results in a small amount of cracks (lines 44-66 of column 2). However, Kobayashi fails to teach or even suggest the enhancement of the bonding strength between the solid electrolyte substance and the non-electrolytic ceramic pipe.

Nanataki teaches a partially stabilized zirconia. Precursors of an MgO ingredient, Al_2O_3 and/or SiO_2 ingredient are added to the stabilized zirconia as sintering aids. Precursors of MgO, Al_2O_3 and SiO_2 ingredients give glass. This glass presents in the grain boundary and on the outer surfaces of the stabilized zirconia. The glass is dispersed to decrease micropores in zirconia ceramics to improve thermal shock resistance (see lines 28-42 of column 3). However, Nanataki fails to teach or even suggest the enhancement of the bonding strength between a solid electrolyte body 1 having the stabilized zirconia and an air-introducing sheet 2.

In conclusion, none of Tatumoto, Kobayashi and Nanataki has the consideration for airtightly bounding a chamber with a solid electrolytic sheet and an insulating sheet.

For the above reasons, amended claim 1 is clearly distinguishable from the teachings of Tatumoto even taken in combination with Kobayashi, Nanataki and Fujishiro, and thus, the rejection under 35 USC 103(a) should now be withdrawn.

New claim 16 has been added to the present application to further clarify the present invention. Claim 16 is supported by the present specification, specifically at page 11, lines 17-21.

The first electrode is exposed to a measured gas outputted from the internal combustion engine, and the second electrode is exposed to the reference gas in the reference gas chamber. Therefore, an electric potential difference is generated between the electrodes. The gas sensor, for example, detects an air-fuel ratio of the

measured gas from the electric potential difference. Therefore, it is important to airtightly bound the reference gas chamber with the solid electrolytic sheet and the insulating sheet. Because of the configuration of the multilayered gas sensing element according to the present invention, the reference gas chamber can be reliably airtightly bound by the solid electrolytic sheet and the insulating sheet.

New claims 17-23 are supported by Applicants' as-filed specification particularly at pages 23-26. It is noted that the cited prior art does not teach or in any way suggest incorporation of silicon dioxide in the alumina series insulating sheet. Therefore, claims specific to this feature are clearly distinguished from the applied art. Applicant has also added claims more specific to the amount of silicon dioxide to more clearly distinguish from the applied art.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance and a notice to that effect is solicited.

Respectfully submitted,

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